312 Amended Claims
(with additions and deletions marked)

Claim 157. (Amended) A system for automatically videoing the ~~activities~~ movements of one or more participants or objects~~,~~ as they move about within ~~a predefined~~ the entire performance area~~,~~ of a sporting, theatre or concert event, ~~during a predefined~~ throughout the entire time duration of the event, comprising:

a first set of ~~two or more~~ multiple stationary overhead cameras, not capable of pan, tilt or zoom movement, sufficient to form a contiguous field-of-view of said entire performance area, for generating a first video stream of images ~~that together form a contiguous view of the predefined area~~ continuously throughout ~~the predefined~~ said entire time duration;

a first algorithm operated on a computer system exclusively and solely responsive to ~~the~~ said first stream of video images for continuously and simultaneously analyzing the images from ~~each first cameras~~ all cameras in said first set of multiple stationary cameras in order to detect the presence of ~~any one or more~~ ~~participants~~ ~~or~~ ~~objects~~ each participant or object within each and every camera's view, to determine for each detected participant or object its relative ~~centroid~~ two-dimensional ~~location~~ centroid coordinates within that view, and to ~~combine~~ use this determined information from ~~each and every~~ all said first set ~~camera~~ cameras ~~into~~ for updating a real-time tracking database of at least the ~~ongoing centroid~~ two-dimensional ~~coordinates~~ centroid location of each ~~one or more~~ ~~participants or objects~~ participant or object, relative to ~~the~~ said entire ~~predefined~~ performance area, where said real-time tracking database includes all current and past said centroid locations determined throughout said entire time of said event, and

a second algorithm operated on a computer system exclusively and solely responsive to ~~the~~ said real-time tracking database for ~~dynamically~~ automatically and individually adjusting the current view of each ~~one or more cameras~~ camera in a second set of ~~movable~~ multiple stationary cameras, capable of pan, tilt and zoom movement distinct from ~~the~~ said first set of stationary cameras, wherein each ~~movable~~ said second set camera is automatically directed without operator intervention to maintain an independent view of ~~one or more~~ the participants or objects, where ~~the~~ said second set

of ~~movable~~ cameras outputs a second stream of video images for viewing and recording, and ~~where~~ ~~the~~ wherein said second stream of video images is not used to either determine any participant's or object's ~~centroid~~ two-dimensional ~~coordinates~~ centroid locations or to otherwise update ~~the~~ said real-time tracking database.

Claim 158. (Amended) The system of claim 157 wherein the contiguous ~~view~~ field-of-view formed by ~~the~~ said first set of stationary overhead cameras is substantially parallel to the ground surface within ~~the predefined~~ said entire performance area.

Claim 159. (Amended) The system of claim 157 for further providing a three dimensional model of the ~~activities~~ movements of one or more participants or objects, further comprising:

a third algorithm operated on a computer system responsive to ~~the~~ said real-time tracking database and ~~the~~ said first ~~or~~ and said second streams of video images for determining the ongoing relative three-dimensional coordinates of one or more specific, non-centroid locations on each participant or object and for updating ~~the~~ said real-time tracking database to include the additional three-dimensional coordinates of all detected locations matched with the respective participants or objects.

Claim 160. (Amended) The system of claim 159 further comprising:

markers adhered onto one or more locations on each participant or object to be tracked, where ~~the~~ said markers are detectable by ~~the~~ said first or said second set of stationary cameras, and where ~~the~~ said first or said third algorithms now determine the locations of ~~the adhered~~ said markers and update ~~the~~ said real-time tracking database with the related ongoing three-dimensional coordinates of each ~~detected~~ marker for forming the three dimensional model of each participant's ~~activities~~ movements.

Claim 161. (Amended) The system of claim 160 wherein ~~the~~ said markers are substantially transparent to the participants, further comprising:

said markers adhered onto participants that reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, and

one or more energy sources emitting non-visible energy that is reflected or retroreflected off of ~~the~~ said markers, or emitting energy that is fluoresced in the non-

visible spectrum by ~~the~~ said markers and is detectable by ~~the~~ said first or said second set of stationary cameras.

Claim 162. (Amended) The system of claim 161 wherein the participants are additionally identified, further comprising:

at least one uniquely encoded marker adhered onto an upper surface of each participant to be identified, and

a forth algorithm operated on a computer system for locating and recognizing ~~the~~ said encoded markers within ~~the~~ said first stream of video images and for updating ~~the~~ said real-time tracking database with each participant's identity matched to their coordinates.

Claim 163. (Amended) The system of claim 162 wherein ~~the~~ said uniquely encoded markers are substantially transparent to the participants, further comprising:

said uniquely encoded markers that reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, and

one or more energy sources emitting non-visible energy that is reflected or retroreflected off of ~~the~~ said encoded markers, or emitting energy that is fluoresced in the non-visible spectrum by ~~the~~ said encoded markers and is detectable by ~~the~~ said first set of stationary overhead cameras.

Claim 164. (Amended) The system of claim 157 wherein the participants are additionally identified, further comprising:

at least one uniquely encoded marker adhered onto an upper surface of each participant to be identified, and

a third algorithm operated on a computer system for locating and recognizing ~~the~~ said encoded markers within ~~the~~ said first stream of video images and for updating ~~the~~ said real-time tracking database with each participant's identity matched to ~~its~~ their coordinates.

Claim 165. (Amended) The system of claim 164 wherein ~~the~~ said uniquely encoded markers are substantially transparent to the participants, further comprising:

said uniquely encoded markers that reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, and

one or more energy sources emitting non-visible energy that is reflected or retroreflected off of ~~the~~ said markers, or emitting energy that is fluoresced in the non-visible spectrum by ~~the~~ said markers and is detectable by ~~the~~ said first set of stationary overhead cameras.

Claim 166. (Amended) The system of claim 157 for videoing the ~~activities~~ movements of two or more participants, wherein ~~the~~ said second set of ~~moveable~~ stationary cameras, capable of pan, tilt and zoom movement, comprises at least two cameras and wherein ~~the~~ said second set is additionally directed to automatically reassign any one or more of said second set cameras currently following any one or more participants to instead follow a different one or more participants based upon which camera views are currently blocked by one or more participants in front of another, or upon which camera views are best situated to capture the programmatically desired view of any given participant or game object.

Claim 167. (Amended) A method for automatically videoing the ~~activities~~ movements of one or more participants or objects as they move about within ~~a predefined~~ the entire performance area of a sporting, theatre or concert event, ~~during a predefined~~ throughout the entire time duration of the event, comprising the steps of:

capturing a first stream of video images using a first set of ~~two or more~~ multiple stationary overhead cameras, not capable of pan, tilt or zoom movement, ~~wherein the combined view from all first cameras covers the~~ sufficient to form a contiguous field-of-view of said entire ~~predefined~~ performance area, and where each said first set camera provides images continuously throughout ~~the predefined~~ said entire time duration;

simultaneously analyzing ~~only the~~ said first stream of video images ~~coming~~ from ~~each~~ said first ~~camera~~ set of multiple stationary overhead cameras in order to continuously detect the presence of any one or more participants or objects within each and every camera's view, to determine each detected participant's or object's relative ~~centroid~~ two-dimensional ~~location~~ centroid coordinates within that view, and to ~~combine~~ use this determined information from ~~each and every~~ all said first set ~~camera~~ cameras ~~into~~

for updating a real-time tracking database of ~~at least the ongoing centroid~~ the two-dimensional ~~coordinates~~ centroid location of each ~~one or more participants or objects~~ participant or object, relative to ~~the~~ said entire ~~predefined~~ performance area, where said real-time tracking database includes all current and past said centroid locations determined throughout said entire time of said event;

using ~~the~~ said determined participant and object locations stored in said real-time tracking database to automatically and individually ~~direct~~ adjust, without the aid of an operator, ~~some combination of at least the pan, tilt or zoom movements of each camera in a~~ the current view of each camera in a second set of ~~one or more movable~~ multiple stationary cameras, capable of pan, tilt and zoom movement, distinct from ~~the~~ said first set of stationary overhead cameras, and

capturing a second stream of video images for viewing and recording ~~using the~~ from said second set of ~~automatically movable~~ multiple stationary cameras, wherein ~~the~~ said second stream of video images create independent views of one or more of the participants or objects within ~~the predefined~~ said entire performance area and ~~where the~~ wherein said second stream of video images is not used to either determine any participant's or object's ~~centroid~~ two-dimensional ~~coordinates~~ centroid locations or to otherwise update ~~the~~ said real-time tracking database.

Claim 168. (Amended) The method of claim 167 wherein the contiguous field-of-view formed by ~~the~~ said first set of stationary overhead cameras is ~~arranged so that its combined, contiguous view of the predefined area is~~ substantially parallel to the ground surface within ~~the~~ said entire ~~predefined~~ performance area.

Claim 169. (Amended) The method of claim 167 for further providing a three dimensional model of the ~~activities~~ movements of ~~one or more~~ the participants or objects, comprising the additional step of:

analyzing ~~the~~ said real-time tracking database and ~~both the~~ said first and said second streams of video images to determine the ongoing relative three-dimensional coordinates of one or more specific, non-centroid locations on each participant or object and for updating ~~the~~ said real-time tracking database to include the additional

three-dimensional coordinates of all detected locations matched with the respective participants or objects.

Claim 170. (Amended) The method of claim 169 further comprising the steps of:

adhering markers onto the one or more locations on each participant or object to be tracked;

detecting ~~the~~ said markers using computer based image analysis of ~~the~~ said first or said second streams of video in order to determine the ongoing relative three-dimensional coordinates of each marker, and

updating ~~the~~ said real-time tracking database to indicate the ongoing relative three-dimensional coordinates of ~~the~~ said ~~detected~~ markers matched with the respective participants or objects.

Claim 171. (Amended) The method of claim 170 wherein ~~the~~ said markers are substantially transparent to the participants, further comprising the steps of:

using said markers that reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, and

using one or more energy sources to emit non-visible energy throughout ~~the~~ said ~~predefined~~ entire performance area, to be reflected or retroreflected off of ~~the~~ said markers, or emitting energy that is fluoresced in the non-visible spectrum by ~~the~~ said markers, where the non-visible energy is detectable by ~~the~~ said first or said second set of stationary cameras.

Claim 172. (Amended) The method of claim 171 ~~for additionally identifying~~ wherein the participants are additionally identified, further comprising the steps of:

placing at least one uniquely encoded marker onto ~~a top~~ an upper surface of each participant to be identified;

detecting and recognizing each encoded marker using computer based image analysis of ~~the~~ said first stream of video images, and

updating ~~the~~ said real-time tracking database to indicate the identity of each participant matched to their coordinates.

Claim 173. (Amended) The method of claim 172 wherein the uniquely encoded markers are substantially transparent to the participants, further comprising the steps of:

using said uniquely encoded markers that reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, and

using one or more energy sources to emit non-visible energy throughout ~~the predefined~~ said entire performance area, to be reflected or retroreflected off of ~~the~~ said encoded markers, or emitting energy that is fluoresced in the non-visible spectrum by ~~the~~ said encoded markers, where the non-visible energy is detectable by ~~the~~ said first set of stationary overhead cameras.

Claim 174. (Amended) The method of claim 167 ~~for additionally identifying~~ wherein the participants are additionally identified, further comprising the steps of:

placing at least one uniquely encoded marker onto ~~a top~~ an upper surface of each participant to be identified;

detecting and recognizing each said encoded marker using computer based image analysis of ~~the~~ said first stream of video images, and

updating ~~the~~ said real-time tracking database to indicate the identity of each participant matched to their coordinates.

Claim 175. (Amended) The method of claim 174 wherein ~~the~~ said uniquely encoded markers are substantially transparent to the participants, further comprising the steps of:

using uniquely encoded markers that reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, and

using one or more energy sources to emit non-visible energy throughout ~~the predefined~~ said entire performance area, to be reflected or retroreflected off of ~~the~~ said encoded markers, or emitting energy that is fluoresced in the non-visible spectrum by ~~the~~ said encoded markers, where the non-visible energy is detectable by ~~the~~ said first set of stationary overhead cameras.

Claim 176. (Amended) The method of claim 167 for videoing the ~~activities~~ movements of two or more participants from optimal viewpoints, further comprising the steps of:

using two or more cameras in ~~the~~ said second set of ~~movable~~ stationary cameras, and

during the step of individually ~~directing at least~~ adjusting the pan, tilt or zoom movements of each camera in ~~the~~ said second set of stationary cameras, capable of pan, tilt and zoom movement, dynamically considering the location of each participant or object with respect to the view of each said second set camera and automatically reassigning any one or more said second set cameras currently following any one or more participants or objects to instead follow a different one or more participants or objects based upon which camera views are best situated to capture the programmatically desired view of any given participant or game object.